REMARKS

Claims 8, 10-13, 15-18, and 24-36 are pending in the application. Favorable consideration is requested in light of the following remarks.

Personal Interview

Applicants thank Examiner Tran for the courtesies extended to their undersigned representative during the May 23, 2006, personal interview. Applicants separate record of the substance of the interview is incorporated in the following remarks.

Allowable Subject Matter

Applicants gratefully acknowledge the indication in the Official Action that Claims 25 and 29 have been allowed. For the reasons stated below, however, it is respectfully submitted that the remaining pending claims are also patentable.

Rejections Under 35 U.S.C. § 103

(1) Claims 8, 10, 13, 15-18, 24, 26, 30, 34 and 36 stand rejected over U.S. Patent No. 5,606,485 ("Shamouilian '485") in view of U.S. Patent No. 6,120,854 ("Clarke"); **(2)** Claims 11, 27, 28, 31 and 32 stand rejected over Shamouilian '485 in view of Clarke, and further in view of U.S. Patent Publication No. 2002/0036881 ("Shamouilian '881"); **(3)** Claim 12 stands rejected over Shamouilian '485 in view of Clarke, and further in view of U.S. Patent No. 4,736,087 ("Whitlock"); and **(4)** Claims 33 and 35 stand rejected over Shamouilian '485 in view of Clarke, and further in view of U.S. Patent No. 5,474,649 ("Kava"). The reasons for the rejections are stated on

pages 2-6 of the Official Action. The rejections are respectfully traversed for the following reasons.

Claim 8 recites "a component of semiconductor processing equipment, the component comprising a substrate having a surface and a liquid crystalline polymer coating on the surface of the substrate and forming an outer surface of the component, the outer surface being resistant to plasma erosion and corrosion in the semiconductor processing equipment, wherein the component is a component selected from the group consisting of a plasma chamber wall, a gas distribution plate, a gas ring, a pedestal, an electrostatic chuck and a focus ring" (emphasis added). As recited in Claim 8, the liquid crystalline polymer coating forms an outer surface of the component and the liquid crystalline polymer coating is resistant to plasma erosion and corrosion in semiconductor processing equipment. The applied reference fail to suggest the claimed component having the claimed liquid crystalline polymer coating.

Shamouilian '485 discloses an electrostatic chuck 20 including a base 28 and an insulator 22 on the base 28. The insulator 22 forms the outer surface of the electrostatic chuck 20. The insulator 22 is typically a polymeric material. See the paragraph bridging columns 4 to 5 of Shamouilian '485. The Official Action acknowledges that Shamouilian '485 does not suggest a component comprising, *inter alia*, a liquid crystalline polymer coating on a surface of a substrate and forming an outer surface of a component, as recited in Claim 8.

The Official Action asserts that "Shamouilian '485 clearly teaches the protective coating (22) can be inorganic compound or polymeric compound" (emphasis added; Official Action at page 9, lines 7-8). The Official Action cites to the

paragraph bridging column 4 to column 5 of Shamouilian '485, as allegedly supporting this assertion. Although Shamouilian '485 discloses that the coating 22 can be composed of a polymeric material, Shamouilian '485 fails to disclose that any one of the polymeric materials that it mentions can be used to form the insulator 22 is a "protective coating" that is resistant to plasma erosion and corrosion, as recited in Claim 8. As was discussed during the personal interview, Shamouilian '485 discloses that insulative polymers, such as polyamide, are not resistant to plasma corrosion. Particularly, Shamouilian '485 discloses that the insulator on an electrostatic chuck is typically an insulative polymer, such as polyimide, and when these polymeric insulators are used in a corrosive semiconductor fabrication process, "the corrosive environments **rapidly erode** the polymeric insulator on the chuck" (column 1, lines 29-39; emphasis added). In other words, Shamouilian '485 discloses that such polymeric insulator materials on electrostatic chucks have **no** resistance to plasma erosion and corrosion. Shamouilian '485 does not disclose or suggest that any one of the mentioned polymeric materials can resist erosion and corrosion in a plasma environment. The Official Action has identified **no** disclosure in Shamouilian '485 that supports the assertion that Shamouilian '485 teaches that the coating (22), if made from one of the mentioned polymeric materials, would necessarily be resistant to erosion and corrosion in a plasma environment.

As was also discussed during the interview, Shamouilian '485 addresses this erosion problem of such polymeric insulators by limiting the dimensions of specific portions of the electrostatic chuck to address the erosion problem of these materials. Specifically, as shown in Figure 3 of Shamouilian '485, the height, H, of the step 27 is reduced between the raised central portion 25 and the lower peripheral portion 26

of the insulator 22 (column 4, lines 40-48). Shamouilian '485 does not suggest that the polymeric coating material itself has erosion and corrosion resistance properties. Rather, Shamouilian '485 accepts the lack of corrosion and erosion resistance of the polymeric materials and designs the dimensions of the electrostatic chuck in a specific manner to allow these non-protective materials to be utilized to make this component.

The group of polymeric materials that Shamouilian '485 discloses can be used for the insulator 22 includes polyimide, which according to Shamouilian '485 itself, will be rapidly eroded in a corrosive environment used in corrosive semiconductor fabrication processes. Shamouilian '485 discloses that the insulator 22 can be formed from a polymeric material that has no resistance to plasma erosion and corrosion. One having ordinary skill in the art would have understood that reducing the height of the step 27 between the raised central portion 25 and the lower peripheral portion 26 of the insulator 22 does not enhance the erosion and corrosion resistance properties of the polymeric material itself (e.g., of polyimide). Shamouilian '485 also does not suggest replacing the non-resistant polymeric material with a polymeric material that is resistant to plasma erosion and corrosion.

As was discussed in the Amendment filed on December 27, 2005, and also during the personal interview, Shamouilian '485 discloses applying a protective coating on the upper surface of the insulator 22 to protect the insulator 22 from corrosive and erosive processing environments (column 5, lines 51-55). Shamouilian '485 references Wu et al., which discloses forming a protective coating on polymeric dielectric materials provided on a wafer support in a semiconductor wafer processing apparatus to electrostatically clamp a wafer to the support. Wu

discloses coating polyimide with a thick protective coating of aluminum oxide (column 5, lines 35-39). Wu thus confirms that polyimide is not erosion or corrosion resistant in a plasma environment, but must be coated with a protective coating in order for the wafer support to have erosion and corrosion resistance. In contrast to Shamouilian '485, which discloses using specific size dimensions for portions of the chuck 20, Wu applies a protective coating on the non-resistant polymeric insulator. Shamouilian '485 does not suggest that the polymeric insulator material itself is a protective coating; to the contrary, Shamouilian '485 discloses that the polymeric insulator material is not protective and needs to be coated with a thick inorganic coating to be protected from erosion and corrosion. Applicants submit that Shamouilian '485 would have led one having ordinary skill in the art away from leaving the polymeric material of the insulator 22 uncoated, i.e., without a thick protective inorganic coating, when exposed to a plasma environment.

Despite these substantial differences between Shamoulian '485 and the claimed component, the Official Action contends that Clarke discloses a liquid crystalline polymer coating and further that it would have been obvious to modify the Shamouilian '485 electrostatic chuck 20 by using liquid crystalline polymer "because it is capable of withstanding high temperature due to significant melt strength property as well as erosion resistance." Applicants disagree.

For the reasons stated in the Amendment filed on December 27, 2005, which are incorporated herein by reference, Clarke provides no suggestion to modify the Shamouilian '485 electrostatic chuck 20 by using liquid crystalline polymer to form an outer plasma-exposed surface. The only types of surfaces to be rendered corrosion resistant by non-analogous Clarke (i.e., surfaces of a military or commercial aircraft)

are completely unrelated to semiconductor processing equipment. (1) Clarke does not disclose rendering components of semiconductor processing equipment corrosion resistant; (2) Clarke does not disclose applying liquid crystalline polymer to components of semiconductor processing equipment; and (3) Clarke does not disclose that liquid crystalline polymer is plasma resistant. Therefore, Clarke does not suggest that liquid crystalline polymer would be plasma resistant in semiconductor processing equipment. The Official Action has not established that one skilled in the art would have a reasonable expectation of success of using Clarke's coating in a plasma environment.

The U.S. Patent Office Board of Patent Appeals and Interferences in Application No. 09/749,923 (now U.S. Patent No. 6,790,242) found that the secondary reference Fagan failed to meet any one of the same conditions (1)-(3). In the Board Decision, the Board explained that:

> Fagan does not disclose the types of surfaces that could be rendered corrosion resistant. Fagan does not disclose that the fullerene containing material could be applied to surfaces of components commonly used in semiconductor processing equipment. Further, Fagan does not disclose that fullerene containing materials are resistant to plasma from a semiconductor reactor. ... The Examiner has failed to cite evidence in the prior art that the suggestion to modify the cited references as proposed by the Examiner exists. (Pages 4-5 of Decision on appeal under 35 U.S.C. § 134 in Application No. 09/749,923; emphasis added).

The Board decided that that the Office had not established a *prima facie* case of obviousness with respect to the claimed subject matter, and reversed the Office's rejection under 35 U.S.C. § 103. Applicants submit that the Office should properly follow the Board's reasoning in the present application and withdraw the rejection of Claim 8 for this additional reason.

The Official Action contends that Clarke does not exclude a process of coating a LCP on semiconductor equipment (Official Action at page 8, lines 4-5). However, the Office has the burden to establish that Clarke suggests using the liquid crystalline polymer in semiconductor processing equipment, which the Office has not established. See M.P.E.P. § 2142, page 2100-134, which states that "the initial burden on the examiner to provide some suggestion of the desirability of doing what the inventor has done." Because Clarke is unrelated to semiconductor processing and thus does not suggest that the liquid crystalline polymer material would be suitable for such purpose, the Office has not met this burden and thus has not established a *prima facie* case of obviousness. Thus, the component recited in Claim 8 is patentable.

Claims 10, 15, 17, 18 and 26, which depend from Claim 8, are also patentable over Shamouilian '485 and Clarke for at least the same reasons as those discussed with respect to Claim 8.

Independent Claim 13 recites "a component of semiconductor processing equipment, the component comprising a substrate including a surface and a plasma-sprayed liquid crystalline polymer coating on the surface of the substrate and forming an outer surface of the component, the outer surface being resistant to plasma erosion and corrosion in the semiconductor processing equipment." (Emphasis added). The component recited in Claim 13 is also patentable over the applied references for reasons discussed above.

Dependent Claims 16, 24 and 30 are also patentable over Shamouilian '485 and Clarke for at least the same reasons as those for which Claim 13 is patentable.

Shamouilian '881 also fails to suggest modifying the Shamouilian '485 electrostatic chuck 20 to include the combination of features recited in Claims 8 and 13, including, *inter alia*, a protective liquid crystalline polymer coating. Thus, Claims 11, 27, 28, 31 and 32 are also patentable over the applied combination of references.

Whitlock also fails to suggest modifying the Shamouilian '485 electrostatic chuck 20 to include the combination of features recited in Claim 12, including, *inter alia*, a liquid crystalline polymer coating. Thus, Claim 12 is also patentable.

Claim 33 recites that "the component is selected from the group consisting of a plasma chamber wall, a gas distribution plate, a gas ring, a pedestal and a focus ring." In stark contrast, Shamouilian '485 only discloses an electrostatic chuck. Furthermore, Shamouilian '485 discloses that the electrostatic chuck has specific size limitations and the polymeric material and needs to be coated with an inorganic material to protect the polymeric material from erosion and corrosion in plasma environments, because polymeric insulator materials are not resistant to erosion or corrosion. Shamouilian '485 does not suggest using these polymeric materials for any other component than an electrostatic chuck that has these specific size limitations. Moreover, Shamouilian '485 discloses that such polymeric materials do not have erosion and corrosion resistance properties, and thus does not suggest using these polymeric materials to make any other component than the electrostatic chuck, which is designed with specific size limitations to compensate for the lack of corrosion and erosion resistance of the polymeric materials. Clarke and Kava also fail to cure the deficiencies of Shamouilian '485.

Therefore, withdrawal of the rejections is respectfully requested.

Conclusion

For the foregoing reasons, allowance of the application is respectfully requested. If there are any questions concerning this response, the Examiner is respectfully requested to contact the undersigned at the number given below.

Respectfully submitted,

BUCHANAN INGERSOLL PC

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By: ______________________
Edward A. Brown
Registration No. 35,033

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620